Introductory Lectures
for 1815
By
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Lecture for 1815

I have come before you to deliver an introduction to the lectures of the Late Dr. Benjamin Rush on the Institutes and Practice of Medicine, In thus addressing you I do not feel as if I were performing a voluntary task. It is a duty. By the favor of the author of these lectures I have been made the possessor of them, and I should be unworthy of the trust, if I were not by an endeavour to extend the truths they contain, to aim at some slender imitation of the exertion of him who used so much industry to originate and teach them. The present time has been call'd with a sentiment of reproach the age of lectures, In thus adding to the number, I feel disposed to question the advantages that are said to result from their mode of instruction and to ask if greater benefits might not be derived from the more deliberate opportunity which books

When a body floats in water it affects a particular position, and this position is such, that the line which joins the centre of gravity of the body and the centre of gravity of the immersed part is always vertical. —

By Wilkinson a thin man was taken five feet two inches

afford for receiving knowledge and reflecting upon it, than can take place in the hasty transactions of oral discourse - The business of public lectures is like the other practices of the world into which abuses have crept by the interest of men and the oversight of time. Their advantage was real and indispensible to the student at their institution They had their origin with teachers who had knowledge to communicate and who had not the multiplied means of the press to extend that knowledge to other times and places. Printing has changed the mode of many arts and books have now become the common and sufficient instructors of the world. To this remark there are some exceptions. The elements of all knowledge must be address'd to the senses, and in medical study there are some branches so absolutely elementary that an attempt to teach them in any other way than by

exhibiting their objects to the senses would be all in vain. Such branches are Anatomy The experiments of chemistry, The operations of Surgery and Materia Medica where it is properly or usefully taught by shewing and not merely describing the sensible qualities of Medicines. — These subjects will be more easily understood and more impressibly marked by the demonstrations of a lecturer. An other occasion on which lectures may be useful is when they contain knowledge or peculiar opinions which cannot be obtained from any other source. I need scarcely say with what pleas & claim your attention. The lectures you will hear contain not only the record of as much experience as has fallen to the lot of any teacher, but they contain original deductions from this experience and an

application of principles thus deduced to the purposes of Medical practice. That you may know the opinions contained in these lectures are original and useful, I have only to state that the trial and conviction of their truth throughout a whole country has overcome as powerful an opposition as was ever raised against any innovation and that with the double operation which many truths have of offending and convincing, they have by the same persons been both condemned and practiced.—

I have said the object of the lectures I will read to you is to teach the Institutes and practice of Medicine. The systematic division that has been made of these two great branches of Medical study is as follows The Institutes have been separated into Phisiology which treats of all the actions

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of the body in a healthy state: Hygiene which lays down the rules for preserving these healthy actions; Pathology which describes the actions of the body in a diseased state, and Therapeutics which points out in a general way the qualities of medicines for the cure of this diseased state. The Practice of Medicine enters into the detail of all the general rules laid down in Pathology and Therapeutics. The separation of Institutes and Practice of Medicine, is no more than that division which every science admits into a speculative and practical part. - Physiology or the first ~~part~~ branch of the Institutes, among other actions of a healthy body, treats of the form and uses of the muscles and parts and the mode of their operation in the exercises of walking running leaping and Swimming and I have chosen for this introducting

lecture to enter into the detail of the Physiological action of the exercise of Swimming

Man is almost the only animal that cannot swim naturally, and he is almost the only animal which by his arts can overcome those necessities to which his structure seems to limit him. It becomes then a subject of philosophical enquiry why man cannot swim naturally and by what management of his body he can remedy this natural incapacity. The whole art of swimming depends upon the body being of less specific gravity than water, and upon the proper position and muscular exertion of that body. And first of the Buoyancy necessary for swimming. The human body is in general so much lighter than an equal bulk of water that it will remain suspended at the surface when immer

sed in it - This absence of gravity will 7.
appear essential to the art of Swimming, If
we consider that when animals move in
fluids lighter than their bodies, there is a two
fold exertion necessary one to give them a pro:
=gressive motion thro' it, the other to prevent their
sinking. Birds move thro' the air which is much
lighter than their bodies, by means of this two fold
action of suspension and progression, and the
great mass of flesh on the breast of these animals
shows the strong muscular power applied to
the wings for the laborious exercise of flying.
But man has proportionally to birds very little
strength, enough indeed to move him slowly
thro' the water when he is supported by its greater
weight, but far short of that vast power wh.
would be necessary for his support and pro:
=gress if the water were much lighter than his

body. If the muscular power of man were much increased beyond its present limit then the weight of the body might be greater than water, for this additional strength would support ~~the body~~ it in the lighter fluid, and swimming would then be effected upon the principles of the art of Flying. - In order that man may swim then his body should be somewhat lighter than an equal bulk of water, that it may be supported on the surface, and the experience of divers proves that it is so. They cannot dive to great depths ~~except they~~ without increasing their weight by some heavy body, or by giving themselves a powerful impetus by a fall from a hight, or by strong exertion in swimming downwards, nor can they remain beneath except they ~~sink~~ grasp stones or ~~roots~~ or something permanent to retain them. - But this subject of the specific gravity

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of human bodies has been exhibited with 9
more precise detail by Mr. Robertson in the fifteenth
volume of the Phil: Transactions. He employed a
cistern six feet and a half in length, thirty inches
wide and thirty inches deep. He noted the weight
of the man; the height of the water in the cistern be
fore immersion; and the height the water rose to after
immersion, He then calculated the weight of
the water which thus rose upon the immersion
and the bulk of this being exactly equal to
the bulk of the body, its weight when compared
with the weight of the body gave the relative
gravities of the body and water. — From a tab
ular view ~~which~~ he has given of all these par
ticulars in the cases of ten men whom he sub=
=jected to his experiment, it appears that one
was one pound heavier than an equal bulk
of displaced water, and consequently sunk
two were of equal gravity with their respec
tive bulks of displaced water and therefore —

would remain immersed at any point in 10
it, one was fourteen pounds lighter, and would rise
one was, eighteen pounds lighter -
one was twenty four.
one - twenty five
two - thirty and
one - thirty two pounds lighter than their
respective bulks of displaced water. - It appears
from these experiments that the specific gravities
of men bear no regular proportion to their heights.
for of two of the subjects each of whom was
five feet four inches in hight, one was twenty
and the other thirty pounds lighter than the wa
ter. - It appears also that their specific gravities
bear no regular proportion to their bulk, for of
two of the subjects, each of whom displaced the
same quantity of water consequently having the
same bulk, one was of the same weight as
the displaced water and the other twenty
four pounds lighter. - As the specific gravity

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of a man then does not depend upon the hight or bulk of his whole body, the cause of the variation must be looked for in the relative size of the different parts of it, for these parts have different specific gravities. The head is the greatest and much superior to water, the gravity of the limbs is less than the head but greater than water, the body is about the same as water, and the chest is the lightest part, now the chest is so much lighter than water as to counterbalance the greater gravity of the head and limbs, so that the whole body when immersed is lighter ~~than the water~~. - There is a common notion that fat men are lighter in the water than those of a spare or slender form. Analogy would lead us to believe it, tho' I have met with no accurate observations or experiments that make it certain. This view of the relative gravity of the parts of the body may enable us to judge of the buoyancy of a man

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by his form. If the limbs and head be small 12.
and the chest large or the whole body fat, he
will float easily near the surface of the water.
Recollecting that I am still considering merely the
buoyancy of the body from its greater levity
than water without any aid from muscular
exertion, it is proper to consider in what manner
its levity and the difference in the weight of its se-
veral parts will cause it to float. The centre
of gravity of the human body is in the middle
of a line drawn across the hips, and this centre
which represents the weight of the whole mass is
below the chest or lightest part, therefore when the
body is immersed ~~in the water~~ the chest will re-
main above and the hips will descend till the
body becomes erect in a in this posture will
float, sinking more or less beneath the surface according
to its specific gravity. Thus recurring to the pre=

ceding experiments, the man whose weight was one pound more than an equal bulk of water would sink to the bottom, those who were lighter would remain at the surface with as much of the body above it as is equal to the difference of the weight of the body and the water, and this part will always be the upper part of the head. If we suppose the head of a man to weigh twenty five pounds, then that one who was twenty five pounds lighter than the water could float with the whole head above the surface. But such a levity is rarely to be met, and the body generally sinks till the water rises to about the height of the eyes or above them.-

I have thus far considered the first essential quality for swimming the levity of the body. but this alone would not enable a man to

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continue in the water. - Since this position he would assume would be as we have just seen with his mouth and nose below the surface and this would prevent respiration on which his life depends. In order then that he might live in the water by means of his levity it would be necessary that he should so far incline his head backwards that the portion ~~which~~ remaining above the surface might be the nose and mouth, But the face being in this case horizontal and the head thrown back to nearly a right angle with the body, the posture would be too constrained and painful to be borne for any length of time, but supposing this posture were no inconvenience, yet from the slight difference in the gravity of the body and water and ~~from~~ the small elevation the face would have above the surface, the slightest

impulse such as the movement of a limb or the mere stroke of a wave would be sufficient to plunge the body so frequently and so far below the surface as to disturb the breathing very much and finally to destroy it - another cause then for the support of man in order that he may live in the water, must be sought besides his bulk and this cause will be found in the second essential for swimming a proper muscular exertion. - ~~This [illegible] position [illegible] is thus obtained by the action of the muscles~~. This head includes the consideration of the proper position for swimming since this position is maintained only by muscular exertion. -

The position which offers greatest resistance to the descent of the body in water is the horizontal one, and that of least resistance the upright, for in these opposite cases there is the largest and smallest possible sur-

v. On the back let us suppose. –

face directly opposed to the water in its passage thro it - But we have seen that the body when immersed falls to the upright position, the least advantageous for support. In order therefore to bring it to the proper horizontal posture the water below must be struck by the feet, this clearly the limbs to the surface and sets the whole body up to the horizontal line. But the stroke of the feet in this situation would not prevent the limbs sinking again to the upright direction, The horizontal line then must be preserved by other means. There are a strong contraction of the muscles of the back and loins by which these parts are kept in a rigid line with the chest. Now the chest being the buoyant part of the body and floating at the surface, the inferior parts are made by this rigidity to project as it were from

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the Chest as a fixed point, and thus the 17.
horizontal posture is maintained at the sur
face. - I wish what I have here remarked
of the Back and Hips being kept in a
rigid line with the Chest to be remembered
since I shall more than once recur to it
and I hope to show that upon this more
than upon any other point the art of
swimming depends. - In treating of the hoy:
ancy of the body I said a man could not
live in the upright position in water, be:
cause he could not keep the head thrown back
so far that the part which remained above
the surface might be the nose and mouth.
But in the horizontal line in which he is
now supposed to be, this difficulty no longer
exists, and the smallest inflection of the
head will enable him to breathe with
perfect freedom. Since then the body ~~he~~

extended on the back along the surface 18
has most buoyancy because nearly all the
body is immersed and as the small portion
that remains above is the face which al
lows respiration, it follows that the best
position for swimming would be for a man
to throw himself on the back, bring the body
straight at the surface and by striking with
the limbs to move thro' the water.- But this
mode of swimming on the back tho' the
easiest to be learned if the art were taken
up synthetically, yet from the slowness of the
motion in this posture, and the violence it
offers to the habits of man, by his thus moving
in the opposite direction to which he looks
and his lying on the back, it is generally
the last acquired or practiced.- Swim
ming is always learned by turning from

this supine to the prone position, or with the breast upon the water. Now this prone position immediately diminishes the Bouyancy of the body, for since when supine it was of the same gravity with the water, from a small part only being above the surface, and as respiration would continue from that part being the mouth and nose, when the body is turned to the prone position, it becomes heavier than water, from the impossibility of breathing in this situation without keeping the whole head above the surface. hence arises the necessity of muscular exertion in swimming on the face, to support the body, rendered heavier by this elevation of the head,

the phenomena of swimming in this prone position are. First the man throws himself on the surface of the water, he reflects

the head from its right line with the body to nearly a right angle, the legs being heavier than water would sink if he did not contract the muscles of the back, these by having one of their attachments to the chest or upper part and the other to the hips, the latter are elevated and held at the surface, and consequently the legs are kept from sinking to their natural situation in the ~~lower p~~ water. The hands are now slowly stretched out. at the same time the joints of the lower limbs are slowly bent, then the hands are forcibly brought round with the palm opposed to the water ~~and~~ at the same moment the legs are violently extended, The water yields to these impulses, but it cannot yield as fast as they can be moved, and this difference of velocity in the limbs and the

yielding of the water, becomes a solid surface for the limbs to press against, and the body moves forward with a velocity derived from this solid resistance. I said that in swimming on the face, with the head and neck out of water, the body has no buoyancy consequently the movement is like flying, in which the body besides being ~~supported~~ moved forwards must be supported, and moved the mode of action in swimming exactly resembles the flight of those birds which move thro' the air by a succession of curves. as the woodpecker and common yellow bird of the country. For the body lying somewhat obliquely at the surface, the legs being a little lower than the chest, when

the water is struck by the feet, the chest is pushed forward and out of the water but being in that raised position, much heavier than before, it is brought back to the water after making a curve on the surface, which curve is forming whilst the hands and legs are preparing for a new stroke, just then as the head is about to plunge beneath in this curve a new stroke is given, and thus by a succession of leaps the swimming is continued —

After this art of swimming on the breast has been acquired, an other mode of swimming on the Back is attempted tho' this as I have already said could be much more easily learnd than the first —

It is done by turning the body on the back

so that all but the face may be un-
-der water, the inferior portion of the body
is ~~then~~ to be relained near the surface by
the exertion of the back and then by the
forcible stroke of the feet the movement is ef-
-fected. The ease with which the body is
supported in the supine position is manifest
from the action of the legs alone being suff
-icient for swimming, whilst the arms may be
folded or remain at rest, whereas ~~to~~ swim
ming on the breast is impracticable without
the exercise of the hands.

There is another mode of the body in the supine
situation called Floating. In this the body
rests horizontally at the surface, being suppor
ted by a moderate motion of the hands,
But this support is made at the chest a part

v. as they make no effort against the water
for their support,

which from its levity has no need of it.
The inferior heavy portions of the body must be upheld by preserving a stiffness of the back hips and legs, that they may project by an inflexible line from the chest which remains fixed to the surface by its levity and the motions of the hands. - This particular management of the back I have before spoken of as essential to swimming on the breast, But tis the sole cause of Floating. —

I have heard that persons have been able to float without using the hands, This ability if possible is certainly very rare, and must depend upon a structure not often to be met with, If a man has a small head, large chest, slender muscles and limbs or much fat, then perhaps by merely making that muscular rigidity he

cessary to keep the body horizontally extended he might be able to float for a short time. I say for a short time only for tis impossible to continue long that muscular exertion by which the body must be kept horizontal. There is no such thing in a healthy body as the constant action of a muscle without a relaxation of it, and the most intolerable pains arise from an endeavour to preserve a permanency of Muscular contraction. - The only account of floating without some exertion of the body, which I have met with worthy of reliance is taken from the Philosophical transactions, and is as follows. -

" The Lords of the admiralty have appointed for the exercise of the scholars belonging to the royal academy at Portsmouth a small yacht wherein during the summer months those young gentlemen are taught the practice

of working a vessel at sea, under the direction of one of the master attendants assisted by eight or ten sea men. The last time this yacht was out one of the scholars was ordered to have the lead, The youth was about thirteen years ~~of age~~ old small for his age, and far from being fat; as he was stepping on the gunnel he fell overboard: ~~the yacht had~~ The sea was rough and the yacht had great way so that he was presently at a very considerable distance from the vessel. The skiff was immediately let down, but the painter not being fast, the rope run an end and the boat went adrift. One of the seamen jumped overboard, got into the boat, brought her along side of the vessel, took in another man and then went after the youth

whom

they recovered after ~~they~~ he had been in the water more than half an hour. The young gentleman relating the affair said, that as he could swim very little and judging he should sink if he strove against the waves, he turned on his back and committed himself to their mercy. He kept himself perfectly calm, and observed when a wave was likely to break over him, to hold his breath and to spout out the water forced into his mouth."

This case took place in sea water in which the buoyancy of the body is greater than in fresh as a cubic foot of salt water weighs 73 pounds whereas a cubic foot of fresh weighs but 70. ~~[illegible]~~ I have never heard from any authority worthy of credit, of mans floating in fresh water, and without the peculiar

structure before mentioned I do not think it possible.—

There is an operation of swimming call'd Treading water in which the body is kept upright with the head and shoulders above the surface.— This is effected by the alternate elevation and violent stroke of the feet against the water. It is one of the most toilsome modes of swimming and can be continued but for a short time, owing to the great muscular exertion necessary for it. For in this case there is a strong tendency of the body to descend from so much of it being out of the water, and the resistance to this descent is only made on the small surface of the soles of the feet.—

There are some other movements in the water exhibited as feats of display by dextrous swimmers.— But these need no particular

notice as they are depend on the prin-
ciples which have been laid down. —
I have thus considered the ~~varieties~~ phenomena
of swimming under the two heads of the buoy-
ancy of the body and muscular exertion, un-
der the first I pointed out the relation of the
gravity of the whole body and its parts to the wa-
ter, and the position which this cause it to assume.
under the last I have shewn how the horizontal
posture is maintained by muscular exertion and
how the body is propelled by it. I shall now
take notice of some other particulars of the
art of Swimming, which tho' they are to be
explained by the previous principles, yet could
not be without a confusing digression be brought
under the preceding heads. —
It has always been a question, why man
cannot swim naturally, when it is done by

nearly every brute however young the first time it goes into the water. — This is commonly explained by saying that in man fear prevents that use of his limbs which would support him if he placed a confidence in his exertions, whereas brutes swim because they are destitute of fear. This view however will not account for it, since a little attention will inform us that most brutes are not without this apprehension, and some resist with violence any attempt to put them in the water. Instead of an explination then it is only an instance of that insolent philosophy and acceptance logic which the vulgar always employ in their enquiries after causes, which fixes on any manifest attendant circumstance, as the real efficient cause of an effect. But the question is of the easiest solution by attending

only to the different structures of Man and brutes — —

Man is formed to walk erect on a firm resisting surface with the centre of his gravity perpendicular to the base on which he moves. If at any time that perpendicularity should be lost so as to indicate his falling forward there is instantly an endeavour made to prevent it by throwing the foot forward that the line of the gravity may fall within them. — and this intention and the consequent motion is associated by long habit with the least perception of a tendency to fall. Now when a man goes into the water who cannot swim he finds himself sinking or falling. The only precaution he has been in the habit of using against falling is to bring his feet under the centre of gravity at the same time he throws out his hands to save the concussion. If

the body. This mode he at once has recourse to, but it is a vain endeavour for safety, as throwing the feet forward under the centre of gravity brings him to the upright position, and this as we have before seen is the least advantageous for support, ~~in the water~~. He makes violent exertions with his feet and this with the upright position he has now assumed, puts him exactly in that state as in the under the head of treading water. and this we know cannot be continued even by the most expert swimmer for any length of time. the consequence is that he is unable as in treading water to make any progressive movement, and becoming soon exhausted by his exertions, he sinks beneath the surface and is suffocated. Such being the position a man assumes when he goes into the water and as this position results from his structure

and habits, we may further see how these same causes prevent his practicing the proper motions for swimming the first time he has occasions for them. — For swimming requires exercises of the body opposite in every respect to the habitual exertions of it. In

Mans usual motion is made in an upright posture, in swimming it is horizontal. In walking or running on the earth, the legs are moved alternately, in the water they are moved together constituting a leap. In walking the hands are pendent and vibrate with no exertion across the body. In swimming they are moved with great labour in a manner opposite to their former direction, In walking the head is supported by the pillar of bone of the back and neck and not by muscular power, In swim

ming the head being thrown back to 34
an angle with the body, ~~and the body to~~
~~be horizontal, the~~ its whole weight ~~of the~~
is supported by the action of the muscles
But the great distinction and that on which
the art of swimming chiefly depends is a
certain contraction of the muscles of the
back, to retain the hips at the surface
of the water, which is not necessary for the
ordinary motions on the earth. — Now this
difference between the management of the body
in the water and upon the earth, is not
known by man, and even supposing the
knowledge of it were communicated by
instruction, it might indeed facilitate
the acquirement of the art of swimming
tho' without some experimental trials

of those different motions he would not be able to support himself on the water. —

But Brutes we know swim without this instruction and experience and as we have seen that man is unable to swim from his structure and ordinary exertions, a little consideration of the structure and ordinary exertions of brutes, will inform us why they swim with so much ease. — Brutes have nearly the same specific gravity as man. consequently about the same relative portion of the body will remain above the water. But it is necessary for life that the same part in each the head, should be above the surface. The head is the heaviest part of man

whereas the head of brutes is comparatively lighter. since there is less brain in proportion, the bones of the head are more spongy and there is a greater cavity within the jaws and in the nostrils. Brutes then have an advantage over man in the hygeancy of the parts of the body, But they have besides other advantages, for the neck and head being longer they more easily stretch the lattes to the surface of the water for respiration. The usual position of the neck and head being horizontal, ~~the~~ and not supported by the back bone as in man they are furnish'd with a strength of muscle to support it without fatigue, therefore that elevation of the head which is mans greatest inconvenience, is not felt by brutes. — The centre of gra

vity of brutes is about the lowest part of the chest, so that when thrown into the water they naturally take a position with the legs dependent and the head upright nearly the same as their position on the earth. In the second point then or in position the brute has the advantage over man, for since this is the same in his body that he has been used to, it is only necessary to make a slight elevation of the head and neck to be in the true posture for progressive swimming. - But man must make a painful elevation of the head and a rapid contraction of the back and hips. As regards the third point or the muscular exertion for the swimming of brutes the advantage is more considerable, we have seen how many difficulties man has to encounter.

in this part of the function. But in brutes, the motions are all the same that he is habituated to on earth, he has only to walk thro' the water to move forward. Thus whilst men have so many things to learn different from their usual habits, brutes have only to learn to stretch the head to the surface of the water, and this the necessity of breathing teaches them the moment they fall into it:

I have said that a knowledge of the theory of swimming or the means by which it is effected would facilitate the acquirement of the art, but this alone would not be sufficient without the experience of trials in the water. This suggests to us the consideration of the mode in which the art is acquired and the means that are occasionally

employed to teach it. —

The art of Swimming like all other arts is learnd in the tedious school of many failures, but each successive endeavour brings it nearer the perfect execution, When a boy first goes into the water, he is well aware from seeing others, of the manner of making the stroke with the hands and feet, but this stroke however regular ly made will not support him or enable him to swim, whilst he remains ignorant of the method of bringing his body to the horizontal position. Any one who remembers his first attempts at swimming, or has seen other boys learn must have observed that they immediatly catch with their feet at the water beneath the body or centre of gravity

which brings them to the upright position, and as the art is always undertaken in shallow water, the feet soon touch the ground and the attempt is at an end. If the water be so deep that the feet when thus brought under the body cannot reach the bottom, the upright position it assumes puts it into the state of treading water, so that after the few rapid and violent strokes which this posture requires, it sinks - Thus we see boys learning to swim make very violent exertions and yet make no progress thro' the water. - They are generally told as instruction on these occasions to be more moderate in their motions, and that they will do better if they are not so rapid. There is great want of observation in this remark, For except the body be in a different position

from that boys always assume when they first attempt to swim, no other than this violent exertion will support them, Before therefore they are told to be lifs impe= tuous they should be directed to raise the hips to the horizontal line, for then alone when the broad front of the body is pressing on the water with a moderate action of the arms and legs suffices. For with the back convex and the feet dependant or with an approximation to the posture of treading water, the motion must be violent, as the best swimmers exhibit, in the forcible impulses they are obliged to make on the water to support themselves for a short time in this upright position.—

After the boy has made many unsuc= cessful attempts to support himself by this

violent exercise of his limbs, he finds 42
by accident or design, that the more he
elevates the hips to the surface by straightening
the back, the more easy the support becomes
and the more progress he is able to make thro
the water, till at last he attains a complete
dominion over that muscular management
which elevates the body to the horizontal pos
ture, and then and not till then he becomes
a Swimmer. —

Boys in learning sometimes make use of light
substances as bladders, corks and pieces of wood
the bladders and corks are usually placed
about the chest and by their buoyancy prevent
the body from sinking even in the upright
position. But these are generally slow aids
as they do not teach the essential art of
elevating the back. The use of a long
piece

of wood is better. For the boy laying his breast upon it whilst it extends his whole length, the lightness of the wood elevates the body, hips and legs to the horizontal position, and teaches him to retain the same situation when the wood is removed. The teachers of the art generally take boys into the water, and support them with the hand under the body, they then bid them to strike the hands and feet regularly. The great aim of this mode seems to be to teach the art of making the regular stroke. But the advantage of the mode really consists in the elevation of the back, so that often a boy has been held in that position for sometime by his master, he associates

this horizontal posture with his attempts to swim, and when the hand is removed he is necessary to preserve it by the muscular contraction of the back. Thus the hand under the body and the piece of wood are not of service from the buoyancy they give, but because they direct to the proper and indispensible posture. Nor are these aids of much consequence in teaching the stroke, as the support of the body does not much depend on its regularity. Regularity of stroke is absolutely necessary to rapid progressive motion But it betrays want of observation, to say that a regular and synchronous action of the limbs is a necessary preface to the art of swimming, since we see in good

swimmers who are masters of the great essential for the art, the flat position, can support themselves with the most irregular motion of the limbs. And those postures they go through for the display of feats of dexterity, are made by a wide departure from that praiseworthy and regularity of stroke, which are supposed so necessary for the acquirement of the art.

The art of swimming on the back and Floating are acquired also by learning to bring the body horizontally to the surface. If we observe a boy attempting to swim on the back or float, we see he is not master of this art of projecting the body along the surface, for

tho he pushes the feet above it, the hips remain sunk and the body curved, and as in this curved posture he has lys extent to oppose to his ascent in the water, he can maintain that floating posture but for a very short time.—

From the principles which have been laid down we may easily point out by what means swimming may be most rapidly made and longest borne without fatigue.— The first requisite for rapid swimming is Buoyancy, for when the body is easily supported, lys muscular exertion is required for that purpose and more can be given for its progressive movement. The requisite in structure is a broad palm

and sole, and great muscular power 47.
for the for the forcible exercise of these. —
The means in position is that in which there
is least resistance which is when the body is
thrown on one side in its progress, for the
difference of resistance will be then just e=
qual to the difference of breath and depth
of the chest. — and I am told that the In
dians of our country who are expert
swimmers use the side method habitually.
The power of swimming a long time, de
pends upon the same principles as the long
continuance of any other muscular exertion
the strength of muscles and the habit of
using them. Some men from habit are
able to perform great exertions in this
way.

Dr. Franklin when a youth drew con 48
siderable notice in London from an ex
ploit in swimming from Chelsea to Black
friars bridge, a distance ~~[illegible]~~
~~[illegible]~~ of about three miles. and Baron
Humboldt relates that there are men
in Peru who perform the duty of the
letter post by swimming down their
rivers for a journey of two days, resting
occasionally in their course. They use a
small log as an aid in their support, and
carry the letters bound in a turban about
their heads. — Capt. King during his stay
at the Sandwich islands saw a child of
only four years of age, that had been
accidentally over set in the sea, swim about
with the greatest dexterity till it regained
the boat.

From the motions necessary in swimming 9.
we see why that exercise is so tiresome. The
usual movement of man on the earth is
walking. and in this we see one of the abun=
dant instances of the wise economy of na=
ture in providing for the most necessary and
frequent wants of animals. For so small
is the exertion of walking that it is much
less fatiguing than standing equally on
both feet for the same length of time. In
walking, the most of the weight of the body is borne by
the pillar of bone of the limb and very little
by muscular exertion. The only action of the
muscles being the tilting the centre of gravity
alternately on the advanced legs. But
the action of the limbs in the water is a
succession of blows, in which the whole

weight of the body is propelled by the muscles. whereas such is the contrivance of the art of walking that not a fourth part of that weight is moved or supported by them, the remainder being upheld by the pillar of bone. — The exertion of the hands too which are employed in removing the water at a great distance from the centre of motion at the shoulders, the exertion of keeping the body horizontal and the labour in supporting the head, are all attended with great fatigue. —

Dr Franklin has concluded his little practical essay on swimming by saying it is "an art which when once acquired is never forgotten." This is uttered with a kind of aphoristic point, that would seem to limit

its truth with some triumph to this peculiar art. But there are many other arts that are never forgotten tho' learnd with greater difficulty and in much longer times. The power of memory in any art depends on the number, complexity and rapidity of motion necessary for its execution. If the motions be numerous or complex, the power of the memory over many parts of the process will be lost from the weight of the burden, If the art require rapid movements, the ability for them must be preserved by continual exercise - The art of playing on musical instruments, and some of the manufacturing arts which have been aptly term'd the arts of handling are often forgotten in the particulars of their arbitrary detail, since the vast number and manual

sleight of motion they require is too great for the memory, But the more general and leading practice of these arts when once learnd are retaind for ever. — If swimming required such intricate and smart infinite movements as musical performance, the skilful execution would like this after an interm improve be forgotten. But if the theory of swimming given to you be correct, the memory is only required to bear this simple precept, that the back must be elevated to the surface of the water. this may and surely will be retained for the longest life. and as the motions for effecting this horizontal position are not necessarily rapid there is no need of constant practice to preserve ability. The art of swimming then is not forgotten only

because there is little to be remembered. 52
I have never heard that the art of Skating
is forgotten and yet the unaccustomed mo
tions and management of the body for
this exercise are more numerous than for
swimming. As in it there is a necessity for
a rigidity of muscles to preserve the position
but there is besides a necessity to retain the re
collection of the variations of the centre of gra
vity, the most delicate perhaps of our bodily
perceptions, yet when this art is once acqui
red the knowledge of it is indelibly bran
ded on the memory. —

I have thus gentlemen made a round to exhibit to
you some leading views of the theory and art
~~formation~~ of swimming. If I cannot call it an
important subject for your consideration. I

Romans..

"Necit nec litteras nec natare."

at hart believe it to be the mart popular and practical that could be selected from the whole com=pass of Phisiolagy, since every man has some interest in it. The ancients, whose political institutions inculcated and required the prac=tice of Athletic arts used to say in contemp=tuous reproach of the defective education of any one that "he knew neither his letters nor how to Swim." The campus martius at Rome was chosen on the borders of the Tyber that the school and sports of the field and water might be united and relief afforded to the dust and fever of their daily drill. Our times do not command the necessity of an education in this art, and tho' it may be ques=tioned wether the rare occasions which occur of preserving life by it, should make it an indispensible part of instruction, more than

many other arts of equal utility which are not universally taught. yet it becomes an object of interest and curiosity to all, from the attempts that are universally made other through usefulness or pleasure to acquire it.

It is a triumph of modern science which the ancients neither affected or gained, that the intellectual efforts of philosophers have been turned to those practical labours that limit the moral the political and phisical station of man. The intellectual industry of antiquity was wasted in the vanity of its pursuit, and the admirers of its literature, its abstract sciences and elegant arts, must applaud the loss the world has sustained, from the fruitfulness of much of its philosophical labours. We look with wonder on a people

who could confuse its religion with mysticism, and deform its science by the enquiry after first and unsearchable causes, and at the same time with flagrant inconsistency rise to a confession of the want of christianity, and approximate to the sublime inventions of Leibnitz and of Newton.—

This neglect of the highest aim of science its practical application, was not the result of its necessary progress thro' the early steps of imbecility, since Archimedes equally skilled in theoretic and practical knowledge has left his opinion that the practical and mechanical views of science were beneath the mind, and that the theoretic and abstract pursuits were the godlike employment of man. And whilst he has given to posterity whole books on the properties of Curves he has made no mention of those wonderful arts by which he preserved his country from all the attacks of a skilful and powerful enemy. He paid a fatal tribute to his abstract partiality a type to the world of the fatality that must

await the scientific pursuits of man in a
universal reliance on this belief — —

James Rush

Philadelphia
October 1815